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Are Pharmaceuticals Still Inexpensive in Norway?

A Comparison of Prescription Drug Prices in Ten European Countries

by

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Comparison of Pharmaceutical Prices in Europe

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Foreword

On behalf of the Norwegian Pharmacy Association (Apotekforeningen), the Institute for Research in Economics and Business Administration (SNF) has conducted the project ”Comparison of pharmaceutical prices in Europe”. The purpose of the project has been to examine whether the price level of prescription drugs in Norway are higher (or lower) than in comparable European countries. A part of the project has also involved finding a sound method for comparing prices of pharmaceuticals. The data used are delivered by IMS Health.

This report is a follow-up of two previous reports on the same topic. The first report (SNF report 05/08) was conducted for the Ministry of Health, while the second report (SNF report 06/09) was conducted for the Norwegian Pharmacy Association who is also funding the current report. The continuation of this project has enabled us to further develop our analysis and understanding of pharmaceutical pricing across countries. In addition, we can now study the development in prices and price difference across the ten European countries over time.

The project has been undertaken by Professor Kurt R. Brekke (project leader) at the Norwegian School of Economics and Business Administration, Senior Researcher Tor Helge Holmås at the Uni Rokkan Centre, University of Bergen, and Associate Professor Odd Rune Straume at the University of Minho (Portugal). The authors are affiliated to the Institute of Research of Economics and Business Administration and the Centre for Health Economics in Bergen.

We wish to express our gratitude to director Oddbjørn Tysnes and senior advisor Jon Andersen at the Norwegian Pharmacy Association for useful suggestions and comments, although this does not in any way make them responsible for the report’s content and conclusions.

Bergen, May 2010

Kurt R. Brekke

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1. Introduction

1.1. Objective

In this study we compare prices of pharmaceuticals in Norway and nine Western European countries, i.e., Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden and United Kingdom. These countries constitute the basket of countries that form the basis for setting maximum prices for prescription drugs in Norway, and can therefore be considered to be relatively comparable countries. The objective of the study is to see whether prescription drugs are less or more expensive in Norway than in other Western European countries. We also study the change in price levels and price indices over the three last years. Finally, since we have information on prices at both wholesale (AIP) and retail (AUP) level we also compare pharmacy margins across the ten coutries.

1.2. Data and analyses

In this study we have obtained data from IMS Health for the 300 top-selling (prescription bound) active substances in Norway in the first half of 2009. The data set contains detailed information on price, volume, patent status, originals/generics, pack size, presentation, strength, etc. We have prices per pack and per (standard) dose for each product sold within the top 300 substances. Prices are at both wholesale (AIP) and retail (AUP) level. Using the sales data, we compute volume-weighted average prices for each active substance. We also calculate the (percentage) pharmacy margins for all countries using the wholesale and retail prices. This data set is also combined with similar data from 2007 and 2008 based on two previous studies by Brekke, Holmås and Straume (2008, 2009), so that we in addition can study any trends in prices and price differences.

When comparing prices across countries, we construct price indices in which the various products are assigned weights to reflect a representative pattern of consumption in the benchmark country. In this study, we use primarily Norwegian consumption weights, where products or active substances with high sales levels (measured in volume terms) in Norway are assigned a higher weight than products or active substances with low sales levels. In this way, it can be ascertained what a typical Norwegian “shopping basket” would cost in the various reference countries, which gives us a measure of any cost savings.

The calculation of price indices entails a trade off between two aspects: precision versus representativity. For pharmaceuticals, this appraisal is particularly important because many types of pharmaceuticals are involved (for various conditions), and the same pharmaceuticals come in many variants (original/generic, pack size, strength, presentation, etc.). Precision is maximised by comparing the prices of the same packs between countries. The top-selling pack for a given active substance is then typically chosen in the benchmark country (Norway), and the price of this is compared with the price of corresponding packs in other countries.

The problem with price comparisons based on identical packs is that a representative sample is rarely obtained. Firstly, it is often the case that the top-selling pack of a given active substance in Norway is not the top-selling (and thus most representative) pack in the reference countries. In many cases, this pack is not found in other countries, which could typically give a false impression of price differences between countries. Secondly, the comparison of identical packs will typically exclude generics and thus lead to over-representativity of original preparations, resulting in the overestimation of prices in countries with high levels of generic competition. In addition, by selecting only the top-selling pack within a substance, a large amount of information is ignored.

When we examine the sample of pharmaceuticals, both the number of active substances and average pack sizes vary considerably between countries. This indicates problems with representativity if the price comparisons are based on a narrow product definition, i.e. identical packs. Using volume-weighted average prices per active substance for each country reduces this problem. Most price indices are therefore calculated on the basis of volume-weighted substance prices, but we also report price indices based on comparisons of identical packs so that we take account of both precision and representativity.

Many price indices are calculated in the study. First, we calculate bilateral price indices, in which we match products or substances that are common to Norway and a given reference country (say Sweden). We then calculate global price indices in which we only compare prices of products or substances available in all countries in the sample. The price indices are calculated for all active substances, but we also report separate subindices for the patent and generic market segment, and also separate price indices for pharmaceuticals subject to reference pricing (trinnprisregulering).

Using the data from 2007 and 2008, we examine the development in the price indices. There are generally three reasons for why the price indices may vary over time. First, prices of pharmaceuticals might change. Second, exchange rates might vary. Third, there might be changes in the consumption weights and the sample of products across years. Price changes can be detected by looking at the price change for products that are in the sample each year. This gives us the nominal changes in prices for each country from year to year. The impact of exchange rates is analysed by using last year’s exchange rates to recalculate this years price indices.

1.3. Results

The main result is that UK, Norway and Sweden are the three cheapest countries in the reference group of ten Western European countries, wheras Ireland, Belgium and (usually) Germany are the three most expensive countries. This ranking is very robust to how we compute the price indices and also fairly consistent across submarkets as the patent and generic market segments (see summary of rankings according to the various price indices in Table 7.1, p. 36). UK is usually the cheapest country, but for the pharmaceuticals that are subject to reference pricing (trinnpris) in Norway, then Norway is clearly the less expensive country.

When we look at the development over time in the price indices, we see that Norway becomes even less expensive during time. In fact, since 2007 and 2008, all countries become more expensive relative to Norway. Using last year's exchange rates, we show that a significant part of the favourable change in the price indices is due to currency fluctuations. However, we still find that Norway become cheaper compared with the reference countries even after correcting for exchange rate fluctuations (though the differences are much smaller). We then proceed by analysing the changes in (nominal) prices for the products present in 2007 and 2008 using each country's own currency. Here we find that prices tend to decline in all countries, but the price reductions in Norway are among the strongest.

Finally, we use regression analyses to study price differences across the ten European countries in our sample. These analyses confirm our findings from the price index analyses, though the differences in price levels are smaller. We also use regression analysis to study differences in percentage (not absolute) pharmacy margins. These analyses show that Norway has the lowest (percentage) pharmacy margins if we look at all substances. In the patent segment, UK seems to have lower margins.

The low prescription drug prices and pharmacy margins in Norway are likely to be due to strict price and markup regulation in the patent market segment combined with several competition stimulating incentives in the generic market segments such as reference pricing (trinnpris) and generic substitution regulations.

1.4. Structure of the report

The report is organised as follows. In Chapter 2 we describe the pharmaceutical market and various regulatory regimes adopted in this market. We also classify the 10 countries included in this study with reference to the various types of regulatory regimes. In Chapter 3 we provide an overview of the data and present some descriptive statistics of key variables. In Chapter 4 we present price indices for Norway and the nine reference countries. In Chapter 5 we analyse the change in price indices over time. In Chapter 6 we conduct regression analyses to test whether the differences in prices are statistically significant. We also test for differences in pharmacy margins across countries. Finally, Chapter 7 concludes the report with a brief summary of our main findings and a overview of the rankings of countries according to price levels.

Chapter 2. Regulations in the prescription drug market

The market for prescription drugs is generally characterised by low price elasticity of demand and considerable market power on the supply side. From a policy perspective, this is a worrying combination, since an unregulated market is expected to yield high prices and a correspondingly high level of expenditures for drug consumption. Indeed, most countries are using several regulatory instruments in order to control prices and total consumption of prescription drugs. In this chapter we will give a brief overview of some of the most important regulatory instruments used and briefly discuss how different regulatory choices are expected to affect prices and demand for pharmaceuticals. We will then categorise the ten different countries under study with respect to the regulatory instruments used.

2.1. An overview and discussion of different regulatory instruments

We can make a fundamental distinction between supply-side and demand-side regulation. Supply-side regulation attempts to control drug prices directly and can apply to different levels of the vertical supply chain: manufacturers, wholesalers and retailers (pharmacies). On the other hand, demand-side regulation attempts to control prices indirectly through the design of the reimbursement system. In other words, we can distinguish between regulation of the price that the suppliers of drugs receive (supply-side regulation) and regulation of the price that consumers actually pay (demand-side regulation). The latter type of regulation consists mainly of different forms of *reference pricing*, where regulators attempt to increase the degree of competition in the market through the design of the reimbursement system.

Reference Pricing

Reference pricing implies that drugs are classified into different reference groups based on therapeutic effect. For each reference group, the regulator chooses a reference price, which is the maximum reimbursable price for all drugs in the reference group. Any positive difference between the actual drug price and the reference price is not reimbursable.

The effect of reference pricing is to increase the price elasticity of demand for prices above the reference price, which will stimulate price competition and yield lower prices. The lower the reference price is set, the stronger is the effect on price competition.

Generic reference pricing

Under generic reference pricing (GRP) the reference groups are constructed so that each group only contains drugs with identical active chemical ingredients. This implies that GRP by definition only applies for the off-patent market. Thus, GRP is a regulatory instrument that is primarily intended to stimulate generic competition, with the expected price effects occurring in the off-patent market.

Therapeutic reference pricing

Under therapeutic reference pricing (TRP) the reference groups are constructed according to therapeutic (but not necessarily chemical) equivalence. This implies that drugs currently under patent protection can be included, provided the existence of sufficiently close therapeutic substitutes. Thus, TRP implies that (part of) the on-patent market is more directly exposed to stronger competition. It is therefore reasonable to assume that TRP also will stimulate generic competition, leading to lower prices, to an even stronger degree than GRP.

Other instruments to stimulate competition

In addition to specific reference pricing schemes, the demand side can also be regulated through the more general design of the reimbursement system. An important factor here is whether the patient co-payment is set as a fixed fee or as a percentage of the drug price (or a combination of both). By designing the reimbursement scheme such that the consumer pays a share of the actual drug price, the price elasticity of demand is increased. However, the pro-competitive effect of a percentage co-payment scheme is often counteracted by the fact that many countries (including Norway) impose a cap on total drug expenditures (per year and sometimes per script) for consumers.

The absence of both reference pricing and percentage co-payment should in principle lead to a very low price elasticity of drug demand, with a correspondingly low degree of price competition. Among the countries under study, this situation applies to three countries: Austria, Ireland and UK.

Another instrument for stimulating price competition is to allow for generic substitution by pharmacies. This means that, if a brand-name drug is prescribed, the pharmacy can, if possible, dispense a cheaper copy drug instead. This could potentially be a powerful regulatory instrument if generic substitution is either compulsory or stimulated through financial incentives for the dispensing pharmacies.

Price cap regulation

Reference pricing (GRP or TRP) does not solve the problem of cost control for the group of on-patent drugs where no close therapeutic substitutes exist. Therefore, reference pricing is usually combined with supply-side regulation. The most common way to regulate the supply side of the drug market is through price cap regulation, which defines a maximum price for each drug.

Many countries have introduced a price cap regulation scheme commonly referred to as *international reference pricing*. This regulatory scheme implies that the price cap for a new drug is determined as a weighted average of prices for the same (or an equivalent) drug in a pre-defined group of countries. This group usually consists of countries with comparable price and income levels.

The most obvious effect of international reference pricing is that is contributes to an international harmonization of drug prices. The more countries that apply this instrument the stronger the effect.

International reference pricing is now the most common type of price cap regulation for prescription drugs and is applied in a majority of the ten countries under study.[1] The exceptions are Denmark, Germany and UK.

Mark-up regulation

In addition to price-cap regulation at the level of manufacturers or wholesalers, most countries also regulate the mark-ups of pharmacies (and, in fewer cases, wholesalers) in order to control the drug prices that consumers face.

One interesting issue with respect to mark-up regulation is that different mark-up schemes could affect the final consumer prices through the pharmacies' dispensing incentives. More specifically, if pharmacy mark-ups are set as a percentage add-on to wholesale prices, pharmacies would have a financial incentive to increase their (absolute) mark-ups by dispensing more expensive drugs. This incentive could be eliminated by setting the mark-up as a flat fee. Even if the mark-up is set as a percentage, the incentive for pharmacies to dispense more expensive drugs could be counteracted by choosing a regressive mark-up scheme, where the percentage mark-up is lower for more expensive drugs. As we will see below, all these alternatives are currently in use by one or more of the ten countries under study.

2.2 A regulatory classification of the ten countries

Here we classify the ten countries according to the different instruments used in demand-side regulation (Table 2.1) and supply-side regulation (Table 2.2). Notice that this distinction is not always clear-cut. For example, although we have categorized generic substitution as demand-side regulation, this could arguably also be classified as a supply-side instrument. The information is mainly extracted from the PPRI Project ("Pharmaceutical Pricing and Reimbursement Information").[2]

When making this classification, it is important to bear in mind that many real-world regulatory schemes combine elements from the more stylized regulatory models presented above. This means that the assignment of different countries to different regulatory schemes is not always clear-cut. In Table 2.1, ambiguous classifications are marked with an asterisk and apply to Belgium, Ireland, Norway and Sweden.

Let us briefly comment on the ambiguous classifications. First, the reference pricing system used in Belgium can be described as an unusually far-reaching form of GRP. The reason is that the scheme was extended in 2007 to include, in principle, off-patent brand-name drugs without generic competitors in the market. Regarding Ireland, the

[1] In some cases, international reference pricing is combined with other criterias, such as therapeutic benefit, when setting the price cap.
[2] Available at http://ppri.oebig.at

generic substitution scheme is unusually weak, in the sense that generic substitution is merely allowed, but not encouraged through direct instructions or financial incentives. We have also classified Norway as a country with generic reference pricing, although this is not the official name given to the current scheme. However, the system nevertheless has the fundamental ingredients of a reference pricing system (with an exogenously determined reference price). The same argument applies to Sweden, which does not officially use generic reference pricing. However, since it is compulsory for pharmacies to perform generic substitution, unless the patient chooses to pay the price difference between the brand-name drug and the cheapest available generic drug, the system is a *de facto* generic reference pricing scheme. Finally, it is also worth mentioning that even if Germany uses percentage co-payments, this applies only to certain price intervals.

Table 2.1 Demand-side regulation

Country	Generic reference pricing	Therapeutic reference pricing	Generic substitution	Percentage copayment
Austria	No	No	No	No
Belgium	Yes*	No	No	Yes
Denmark	Yes	No	Yes	Yes
Finland	Yes	No	Yes	Yes
Germany	No	Yes	Yes	Yes
Ireland	No	No	Yes*	No
Netherlands	No	Yes	Yes	No
Norway	Yes*	No	Yes	Yes
Sweden	Yes*	No	Yes	Yes
UK	No	No	No	No

Regarding recently implemented reforms in these countries, it is worth noticing that Finland introduced generic reference pricing from 1 April 2009. It is reasonable to expect that this should lead to lower prices, particularly in the off-patent segment.

As previously mentioned, Austria, Ireland and UK are the “outliers” in this group in the sense that hardly any regulatory instruments are used to stimulate generic competition. These countries do not have generic reference pricing, percentage co-payments or regulatory schemes that provide incentives for generic substitution. On the other hand, Germany and the Netherlands are the only countries that apply therapeutic reference pricing, which stimulates competition not only in the off-patent market, but also among on-patent drugs.

Table 2.2 Supply side regulation

Country	International Reference pricing	Mark-up regulation	
		Wholesalers	Pharmacies
Austria	Yes	Regressive (%)	Regressive (%)
Belgium	Yes	Linear (%)	Linear (%)
Denmark	No	No direct regulation	Linear (% + flat fee)
Finland	Yes	No direct regulation	Regressive (% + flat fee)
Germany	No	Regressive (% + fixed fee)	Linear (% + flat fee)
Ireland	Yes	Linear (%)	Linear (%)
Netherlands	Yes	No direct regulation	Fixed fee mark-up
Norway	Yes	No direct regulation	Linear (% + flat fee)
Sweden	No	No direct regulation	Regressive (% + flat fee)
UK	No	No direct regulation	No direct regulation

Regarding the use of supply side regulation, we see that the combined choice of instruments varies quite a lot among the different countries under consideration. The most consistent pattern is that in all but one country, mark-up regulation at pharmacy level is applied (the only exception is UK, where pharmacy remuneration is based on fee-for-services). Several countries also use regressive mark-up schemes (or just a flat fee in the case of the Netherlands) in order to counteract pharmacy incentives to dispense more expensive drugs.

Chapter 3. Data og sample

Data for the price comparisons have been provided by Intercontinental Medical Systems (IMS).[3] We have obtained data from IMS for Norway and the following nine reference countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. The reference countries comprise the nine countries included in Norway's basket for setting maximum prices for prescription pharmaceuticals. In this part of the report we provide an overview of data and the sample of active substances, with particular emphasis on how the prices are calculated.

3.1. Sample

We have got price and volume data for all prescription bound products sold in the 300 top-selling (measured in terms of sale value) active substances in Norway over the period 1 January to 30 June 2009.[4] The sample comprises exclusively pharmaceuticals sold via pharmacies. Pharmaceuticals purchased and sold in hospitals are not included.[5]

The data set contains detailed information on prices and volumes per month for the period in question. In addition, the data contain information on a number of other aspects such as active substance name, therapeutic classification, product name, producer, original or generics, patent status, pack formulation (capsule, tablet, strength, etc.), and pack size.[6]

Information on patent status was missing for 21 active substances. These are mainly older pharmaceuticals (vaccines and a few combination pharmaceuticals). Since we do not know whether these products are patent protected or not, we exclude these from our sample, which leaves us with 279 active substances for Norway.

As expected, not all of the 279 active substances on the Norwegian market are sold in the comparison countries. Table 3.1 below shows how many of the top-selling Norwegian active substances are sold in the other countries. We can see that for the entire sample, the number of active substances varies from 300 in Norway to 266 in Belgium. If we limit the sample to active substances with patent status, the number of active substances varies from 279 in Norway to 246 in Belgium. If we consider active substances sold in all countries – which we refer to as *globally active substances* – the number is 219 for the entire sample and 198 if we exclude pharmaceuticals without

[3] IMS is a company that has specialised in collecting data on pharmaceutical sales throughout the world.

[4] These were the 300 top-selling products over the period September 2008 to September 2009. The turnover figures are based on prescription pharmaceuticals sold via pharmacies.

[5] The sample includes certain pharmaceuticals that can be called hospital pharmaceuticals in the sense that they are prescribed and often consumed in connection with hospital treatment, e.g. etanercept (Enbrel). However, these are only included in our data if the patient obtains these preparations via a hospital pharmacy or a private pharmacy.

[6] In the case of pharmaceuticals not in tablet form, there may be some deficiencies, particularly with regard to strength.

information on patent status. This is a relatively high level of representativity, indicating that the comparison group is good.

Table 3.1 Number of active substances in Norway and the reference countries, 2009

	All substances	Substances without patent status	Substances on reference pricing (trinnpris)	Substances in the sample
Norway	300	21	45	279
Sweden	290	17	44	273
Denmark	285	17	45	268
Finland	279	16	45	263
UK	271	15	44	256
Germany	277	18	43	259
Netherlands	280	16	44	264
Belgium	266	20	44	246
Austria	271	18	45	253
Ireland	272	15	45	257
Global active substances	219	-	41	198

3.2. Price data

Pharmaceutical prices arise in three forms: producer prices, wholesale prices and pharmacy prices. We follow the established terminology and refer to producer prices as the wholesale purchase price (GIP), wholesale prices as the pharmacy purchase price (AIP) and pharmacy prices as the pharmacy sale price (AUP). In the study we primarily focus on AUP since this is the price that the public authorities (insurers) and patients face. However, we also compute price indices at wholesale level (AIP). The difference between AUP and AIP is the gross margin obtained by the pharmacies. We also take a closer look at this.

IMS collects price data in different ways in the individual countries. In principle, it collects information on actual pricing at a point in the distribution chain. It then uses detailed information from each country on discounts, profit regulations and reimbursement prices to calculate the other prices. It also calculates wholesale and pharmacy margins where necessary. The table below provides an overview of how the price data from IMS have arisen for each country.

All prices are free of value added tax (VAT). Price differences therefore do not reflect differences in VAT between countries. Most countries in the sample have lower value added tax than Norway, apart from Denmark, which also has a VAT rate of 25%. Sweden, for example, has no VAT on prescription pharmaceuticals, followed by Belgium and the Netherlands with only 6% VAT. From economic theory, we know that high taxes can contribute to producers cutting their prices to avoid losing sales. However, as long as demand for pharmaceuticals is relatively price inelastic, it is likely that patients bear much of the burden associated with high levels of VAT.

The prices from IMS are in the individual country's currency. We have converted all prices to the Norwegian currency, so all prices are expressed in Norske kroner (NOK). For each month, we use the average exchange rate for the previous six months: For January 2009, we thus use the average exchange rate for the period from August up to

and including December 2008; for February 2009, we use the average exchange rate for the period from September 2008 up to and including January 2009, etc.

Table 3.2. IMS price data: Observed price, source, calculation of AUP and AIP.

Country	Observed price	Source	Calculation of AUP and AIP
Austria	GIP	Official list prices from producers	AIP and AUP are calculated by applying regulated markups for wholesalers and pharmacies.
Belgium	AUP	Association Pharmaceutique Belge	6 % VAT is deducted from AUP. AIP is calculated by using reimbursement prices and regulated pharmacy markups.
Denmark	AIP	Wholesaler invoices	AUP is calculated by applying regulated pharmacy markups.
Finland	AIP	Finnish pharmaceutical association	AUP is calculated by applying regulated pharmacy markups and specific charges.
Germany	GIP	German Health Institute (Lauer-taxe database)	AIP and AUP are deducted by applying regulated markups. Repayments (clawback) to the sickness insurance funds are then deducted.
Ireland	AIP	Official list prices from wholesalers	AUP is calculated by applying regulated pharmacy markups and information on reimbursement prices.
The Netherlands	AIP	Pharmacy invoices	AUP is calculated by deducting estimated AIP discounts and then applying regulated pharmacy markups.
Norway	AIP	Wholesale invoices	AUP is calculated by applying regulated pharmacy markups.
Sweden	AIP	Apoteket	AUP is calculated by applying regulated pharmacy markups.
United Kingdom	AIP	National Health Service	AUP is calculated by deducting estimated AIP discounts and then applying regulated pharmacy markups (dispensing fees).

Price data come in two variants: *price per pack* and *price per dose*. The price per pack will be used when we compare identical packs across countries. We select the best-selling pack in Norway for a given active substance and compare the price of the same pack in the reference countries, where these exist. The advantage of this approach is that precision is ensured in the sense that exactly the same product is compared across countries.

However, the disadvantages are many, and essentially relate to a lack of representativity. Firstly, picking only the best-selling pack for each substance, implies that we throw away information about all other packs for this substance. For Norway there are almost 2500 products, implying an average number of products for each substance of about 8. Thus, comparing prices per pack implies that we on average eliminate 7 products per substance. If we look at the overall number of products, we eliminate information of 2200 products by this procedure, and this is just for Norway.

Secondly, the top-selling (and thus most representative) pack in Norway may not be among the top-selling ones in the reference countries. In the worst case, this pack is not sold at all in these countries. Table 3.3 below shows the average pack size for the countries in the sample.

Table 3.3 Average number of doses per pack.

	All active substances	Substances with patent status
Austria	28.8	28.9
Ireland	43.2	43.4
UK	44.0	44.6
Belgium	44.2	44.3
Norway	50.6	49.9
Germany	51.6	51.6
Finland	52.1	51.6
Denmark	55.2	55.4
Netherlands	55.3	56.0
Sweden	69.8	69.0

We see that average pack size varies between the countries in the sample. Austria has the smallest packages, with an average of 28.8 doses per pack. Sweden, on the other hand, has the largest packages, with an average of 69.8 doses per pack, which is more than double the size of Austria. The pack size in Norway is fairly average of the countries in the sample.

Finally, comparing prices of identical packs will mean that generics often drop out. In the case of active substances that have come off patent, there are often a number of generic products on the market, and these often have a smaller market share than the original product. A selection based on top-selling packs within an active substance could then lead to low representativity of generic products in the segment for non-patent-protected products, and not give a true picture of the price because the original preparation is typically higher priced than generics.

Price per dose is indicated by price per IMS standard unit[7]. A standard unit is a proxy for a dose, and is defined by IMS as a tablet, a capsule, 10 ml liquid, etc. It is difficult to find a perfect measure of a dose, but so long as a dose is relatively constant across the countries in the sample, this will be relatively unproblematic. The advantage of price per dose is that these are defined for all packs and formulations. This makes it possible to calculate an average price for each active substance. Such an approach means that we make use of all price information. This also ensures a good representation of generics. As we will explain later, we weight the prices for an active substance by volume, so that we attach greater importance to the price of products that sell more than to the price of products that sell less. The weightings are calculated on the basis of each country's sales, so that we obtain the most representative price for each country. In this way, we achieve a high level of representativity. This approach is in line with Danzon and Chao (2000), who also provide a discussion of these two approaches.

[7] There are other dose measures used such as price per defined daily dose (DDD), price per gram of active substance, etc. These are not available to us via IMS's data set.

3.3. Volume data

The data set contains two types of volume data: *number of packs* and *number of doses*, where the number of doses is represented by IMS standard units as described above. The volume data are per product (article number) and per month for each of the countries we include in the sample for the whole period.

Volume data are used primarily to weight prices. The number of packs sold is not especially suitable for calculating weights as packs, both within active substances and not least across active substances, have differing numbers of doses (tablets, capsules, etc.). Active substances that typically have many doses in a pack will then be given too low a weight, and vice versa. We therefore use the number of doses as a basis for calculating weights.

We have two types of volume weights: (i) Weights across active substance and packs and (ii) weights within active substances. The weights within an active substance are used to calculated average prices, as will be described in section 3.4. The weights across active substances and packs are used to calculate indices, where they will reflect consumption patterns so that prices of active substances with high sales (high number of doses) are assigned a higher weighting than prices of active substances with low sales. As Norway is the starting point for the study, the price indices will be calculated with Norwegian consumption weights. This is presented in more detail when we calculate prices and indices in the next two chapters.

3.4. Volume-weighted average substance prices

For each active substance, we have a number of different pack types and we also have data for six months. This means that, for each active substance, we have a number of price observations (per dose) where some active substances have relatively few observations and others have relatively many. Furthermore, it is the case that some pack types have relatively high sales, while others are sold to a lesser extent. The aim of the volume-weighted average prices is precisely to take account of this, i.e. we want to weight the prices per dose of the top-selling pack types more than the lower-selling packs. To take care of this, we have, for each active substance and for each country, weighted the price per dose with the proportion of sales this pack accounts for out of total turnover for the active substance in this country. We then sum the volume-weighted prices within each active substance, and thereby get a price per dose per active substance. A simple example may make things clear: Assume that for active substance A (for example in Norway) we have three different packs with the following prices and turnover:

- Pack 1A: the price is NOK 10 per dose and turnover is 5 doses
- Pack 2A: the price is NOK 20 per dose and turnover is 10 doses
- Pack 3A: the price is NOK 30 per dose and turnover is 15 doses

The volume-weighted average price per dose then becomes:

$$NOK10 \times \frac{5}{30} + NOK20 \times \frac{10}{30} + NOK30 \times \frac{15}{30} = NOK23.33$$

The arithmetic (unweighted) mean in the example above is NOK 20. The volume-weighted average price in the example then becomes higher because the most expensive packs are the top-selling ones. If this has been the opposite – i.e. if turnover of the more expensive packs had been relatively low – the volume-weighted average price would conversely have been lower than the arithmetic mean.

Many studies compare prices of identical packs instead of calculating the average price within an active substance. The top-selling pack in the base country is then selected, and the price of this pack is then compared with corresponding packs in the reference countries. In our example, pack 3A is the top-selling one with a price of NOK 30. The problem with this approach is, as mentioned earlier, that this pack may not exist or may have lower sales in the reference countries. In addition, we throw away a lot of information by excluding other pack sizes in the price comparison. Volume-weighted average prices take account of both these aspects, and yield a much higher level of representativity.

3.5. Percentage margins

As we have information on pharmacies' sale price (AUP) and pharmacies' purchase price (AIP), it is possible to say something about how the margins vary between countries. To calculate the margins, we use the most common method (the Lerner index) for calculating relative margins/price supplements in a market:

$$M = \frac{AUP_i - AIP_i}{AUP_i} \times 100$$

The margin is thus measured as a percentage of the pharmacies' sale price (AUP). For each country, we use volume-weighted average AUP and AIP per active substance and calculate margins on the basis of these prices as described above.

3.6. The patent and generic market segment

The sample contains pharmaceuticals that are on patent and pharmaceuticals whose patents have expired and copy preparations (generics) have been launched, or could potentially be launched, as an alternative to the original preparation. It may be useful to break down the sample according to whether or not the pharmaceutical is protected, partly because the competitive situation is different and partly because many countries, including Norway, use different regulations of these two segments. In addition, it is the case that a certain yield (and thus a higher price) will be ensured during the patent period to promote innovation in pharmaceuticals, while the lowest possible price is a natural policy target once the patent has expired. One way of dividing the sample could be to use the patent status variable in the data set. It

emerges, however, that pharmaceuticals within the same active substance are registered both as being on patent (protected) and off patent (not protected). In addition, this variable is difficult to use across countries. We have therefore chosen not to use this variable. However, the data set contains information on whether a pharmaceutical is an original preparation or generic.[8] We therefore observe whether generics are sold within an active substance. In the light of this information, we construct the following two sub-indices:

1. Active substances without actual generic competition in Norway.
2. Active substances with actual generic competition in Norway.

The first index represents the patent segment, while the second index represents the generics segment. All active substances for which we report the sale of generics in Norway in January 2009 are classified as having generic competition. In the case of active substances that do not have generic competition in the first period (January 2009), but have generic competition in one of the next 5 months, we classify the active substance as being without generic competition up to the month when we first report actual generic competition.

Table 3.4 Active substances with generic competition in Norway and globally

	All active substances	Without generic competition in Norway	With generic competition in Norway	Without generic competition globally	With generic competition globally
Norway	279	159	120	116	163
Sweden	273	154	119	114	159
Denmark	268	152	116	104	153
Finland	263	148	115	109	154
UK	256	140	116	97	159
Germany	259	148	111	108	151
Netherlands	264	147	117	105	159
Belgium	246	134	112	98	148
Austria	253	136	117	99	154
Ireland	257	144	113	104	153

A potential problem with using actual generic competition in Norway as a basis for classification in the patent and generics segment is that the size of the patent segment may be overestimated, as substances might have gone off patent without generic competition taking place in Norway. This classification may therefore give rise to incorrect estimation of price differences. In Brekke, Holmås and Straume (2008) we therefore also used a different approach to separate the patent and the generic market segments. In particular, we defined the patent segment by active substances that did not have generic competition in any country. The generic segment would then be the residual number of active substances that had generic competition in at least one country. However, as the results turned out to be quite similar regardless of which approach we used, we choose not to include these indices in this report.

[8] This information does not exist for certain pharmaceuticals. This group is equivalent to those that do not have patent status, as discussed in the introduction. These (21) active substances are excluded from the data set, so that we are left with (279) active substances with information on whether an original preparation or generic is involved.

Chapter 4. Price indices

In this chapter we present the results for the various price indices we have calculated for Norway and the nine reference countries. Price indices are often sensitive to how these are calculated. We have therefore conducted a number of different approximations for calculating the indices. First, we compare prices of identical packs between countries. Second, we compute volume-weighted average prices per dose per substance and use these to compare prices and construct price indices. Third, we calculate bilateral and global price indices at wholesale (AIP) and retail (AUP) level. Finally, we calculate separate indicies for the patent and generic market segments, as well as for the substances subject to reference pricing (trinnpris). Before we present the analyses, we provide a brief theoretical presentation of price indices generally.

4.1. General aspects of price indices

A price index is a weighted average of prices for different products, generally calculated over time, such as the consumer price index. If we have two time periods, period 0 and *t*, and two products, product 1 and 2, we can express a price index as follows:

$$I_P = \frac{p_1^t w_1 + p_2^t w_2}{p_1^0 w_1 + p_2^0 w_2} \times 100,$$

where w_1 and w_2 are weights applied to the respective prices and p_1^0, p_1^t, p_2^0 and p_2^t. In calculating price indices, it is customary to use sold quantities as weights to take account of the relative importance of the various product prices. We can obtain two different indices depending on the choice of weights. If we choose sold quantities in the last period (period *t*) as weights, we obtain the so-called *Paasche price index*:

$$P_P = \frac{p_1^t q_1^t + p_2^t q_2^t}{p_1^0 q_1^t + p_2^0 q_2^t} \times 100,$$

where q_1^t and q_2^t are quantities of product 1 and 2 sold in period *t*. If we choose quantities sold over the base period (period 0) as weightings, we obtain the so-called *Laspeyres price index*:

$$L_P = \frac{p_1^t q_1^0 + p_2^t q_2^0}{p_1^0 q_1^0 + p_2^0 q_2^0} \times 100,$$

where q_1^0 and q_2^0 are quantities of product 1 and 2 sold in period 0. Both these price indices will express changes in average prices over time. If prices are less (more) than 100, this means that there has been a reduction (increase) in average prices over the period.

In this study, we calculate differences in average prices across countries (not over time) to see whether the prices of pharmaceuticals in Norway are higher or lower than in other countries. Let us assume two countries, Norway and Abroad, where products 1 and 2 are sold (but with potentially different quantities). The general price index can then be expressed as

$$I_P = \frac{p_1^U w_1 + p_2^U w_2}{p_1^N w_1 + p_2^N w_2} \times 100,$$

where p_1^U and p_2^U are the prices of product 1 and 2 abroad, and p_1^N are p_2^N the prices of products 1 and 2 in Norway, and w_1 and w_2 are the weights to be applied to these different prices. It is customary to use weights to express the relative importance of the products including when price indices are to be calculated across countries. If we use quantities sold abroad as weights, we calculate a Paasche price index. It is nevertheless natural in this context to use quantities sold in Norway as weights, giving us a Laspeyres price index, which can be expressed as follows:

$$L_P = \frac{p_1^U q_1^N + p_2^U q_2^N}{p_1^N q_1^N + p_2^N q_2^N} \times 100,$$

where q_1^N and q_2^N are quantities sold of products 1 and 2 in Norway. If the price index is more (less) than 100, this means that average prices abroad are higher (lower) than in Norway. However, it does not mean that all prices are higher abroad than in Norway. We can imagine that product 1 has a higher price abroad than in Norway ($p_1^U > p_1^N$), while it is the converse for product 2 ($p_2^U < p_2^N$). The effect on the price index will thus be determined by the weighting, which in our case is determined the Norwegian consumption weights. If product 1 has a low sales volume relative to product 2 in Norway ($q_1^N < q_2^N$), this may give rise to a price index of less than 100, i.e. on average the price level in Norway is lower than abroad.

For most price indices, we will use Norwegian quantity weightings. In this way, we measure what a Norwegian "shopping basket" costs abroad. If Norway is more expensive than the reference countries, the differences in the price index may be interpreted as the cost savings that could be achieved by importing the foreign price level. In Brekke, Holmås and Straume (2008) we also conducted sensitivity analyses where we used Swedish and Danish quantity weightings to see whether the price indices change. Such a comparison means that we import both foreign prices and foreign shopping baskets into Norway. The latter is a more unrealistic measure of possible cost savings. However, the results were fairly robust to these sensitivity checks.

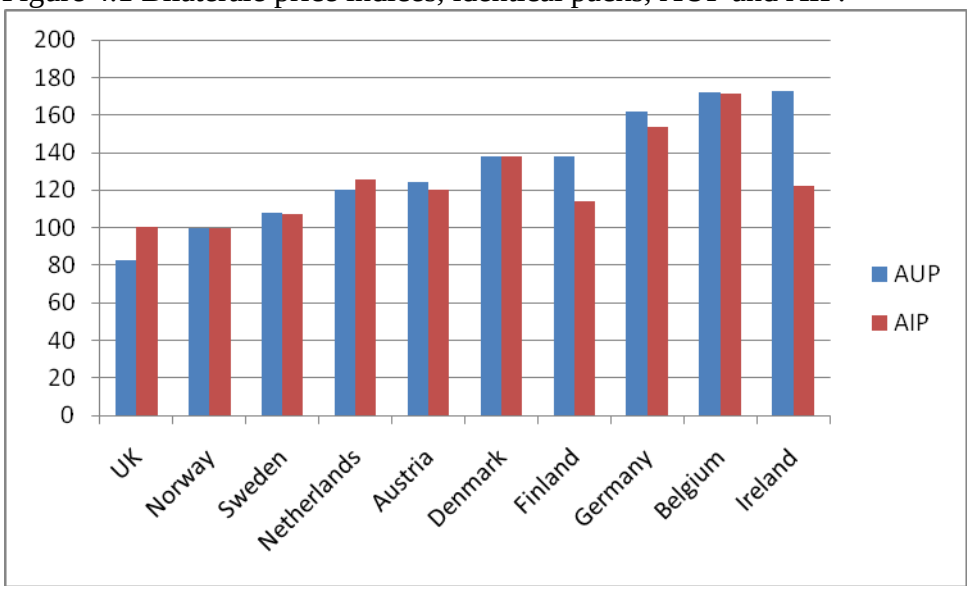
4.2. Price indices for identical packs

Let us first compare prices between countries for identical packs, i.e. packs with same size (e.g. 100 tablets) and strength (e.g. 500 mg Paracetamol). For each of the 279 active substances, we select the top-selling (measured in number of doses) pack in Norway. For certain (28) active substances, the data set does not contain information

on strength. To ensure that we do not compare the price of packs with different strengths, these are excluded. We are left with a sample of the 251 top-selling packs in Norway. These packs are then linked to corresponding packs in the reference countries. We do not require the packs to be available in all countries (global) to be included in the calculation. The matching is carried out bilaterally for each country, so that the number of packs included varies between the reference countries from 190 in Sweden to 63 in Ireland. We then calculate paired price indices for each country based on the selected packs. The prices are weighted with Norwegian consumption weights, where the weights are simply the number of doses sold of a given pack divided by the total number of doses sold. The Norwegian consumption weights are calculated for each reference country depending on which packs are included in the sample.

All the price indices we calculate based on prices of identical packs are reported in Table 4.1 below. We will now only focus on the main results. Figure 4.1 reports the price indices for all packs in the sample at wholesale (AIP) and pharmacy (AUP) level. We have ranked the countries from cheapest to most expensive based on pharmacy prices (AUP), which we consistently will do in this chapter.

Figure 4.1 Bilaterale price indices, identical packs, AUP and AIP.



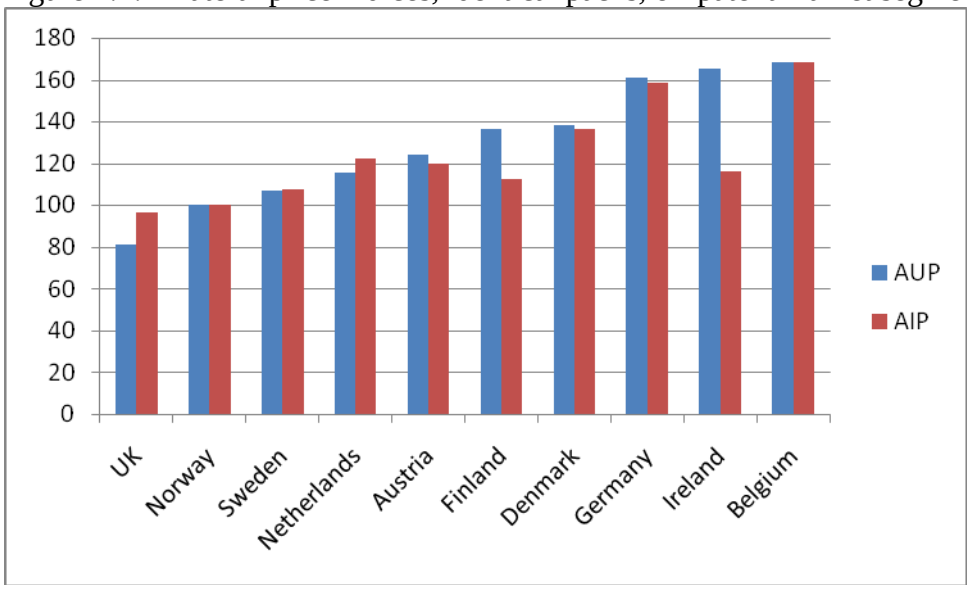
If we look at final pharmacy prices, we see that only UK is less expensive (about 18.2 per cent) than Norway. The third cheapest country is Sweden where prices of prescription drugs are slight (8.1 per cent) more expensive than Norway. The most expensive countries are Ireland (72 per cent), Belgium (71 per cent) and Germany (61 per cent). However, if we look at the wholesale level (AIP), the picture is slightly different. Norway is now the cheapest country, followed by UK (0.4 per cent) and Sweden (7 per cent). The most expensive countries are Belgium (71 per cent), Germany (53 per cent) and Denmark (38 per cent). Ireland is only 22 per cent more expensive than Norway at AIP level. The differences between AUP and AIP are due to differences in pharmacy profit margins, which are very high in especially Ireland but also Finland. On the contrary, UK has very low pharmacy margins, which explains why they are so cheap at retail (AUP) level.

Table 4.1: Bilateral price indices (AIP and AUP) based on prices of identical packs (same size and strenght).

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
All substances										
AIP per pack	100	107,3	138,2	114,3	100,4	153,9	126,0	171,3	120,0	122,2
AUP per pack	100	108,1	137,8	137,9	82,8	161,8	120,5	171,8	124,5	172,9
Number of packs		190	164	161	68	134	77	93	76	63
Substances on patent (without generic competition)										
AIP per pack	100	107,3	136,6	112,6	96,6	158,2	122,0	168,4	119,6	116,3
AUP per pack	100	106,9	138,4	136,5	80,8	160,8	115,7	168,4	124,3	165,4
Number of packs		108	96	89	43	77	51	62	52	42
Substances off patent (with generic competition)										
AIP per pack	100	107,4	143,4	119,9	109,3	139,9	144,8	184,1	121,5	160,1
AUP per pack	100	111,2	136,2	141,9	87,1	164,9	141,1	186,2	125,2	214,8
Number of packs		82	68	72	25	57	26	31	24	21
Substances under reference pricing (trinnpris)										
AIP per pack	100	111,4	149,5	124,8	175,8	185,1	251,5	235,2	146,8	211,1
AUP per pack	100	113.0	142,8	150,9	123,9	201,4	225,5	232,6	152,7	279,2
Number of packs		37	33	36	7	24	10	20	8	6

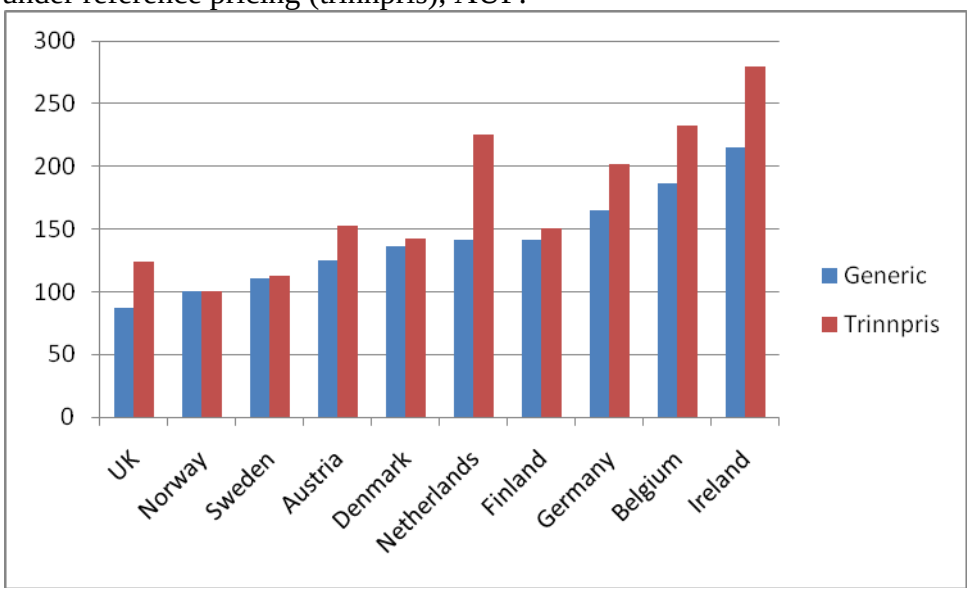
Figure 4.2 below summarises the price indices for the on-patent prescription drugs. We see that the picture is fairly consistent with the overall rankings. UK is 19.8 per cent cheaper than Norway at pharmacy level, wheras Sweden is 6.9 percent more expensive. In the other end, Belgium and Ireland have changed rankings. Belgium is now the most expensive country with 68.4 per cent higher prices than Norway, while Ireland has 65.4 per cent higher drug prices in the on-patent market segment at pharmacy (AUP) level. If we look at AIP level, Ireland becomes even less expensive, with the difference indicating high pharmacy margins.

Figure 4.2: Bilateral price indices, identical packs, on-patent market segment.



Finally, we take a look at the generic market segment. Figure 4.3 below illustrates the price indices at AUP level for off-patent products with generic competition both at the overall level and for the set of off-patent products under reference pricing (trinnpris) in Norway.

Figure 4.3: Bilateral price indices, identical packs in the generic market segment and under reference pricing (trinnpris), AUP.



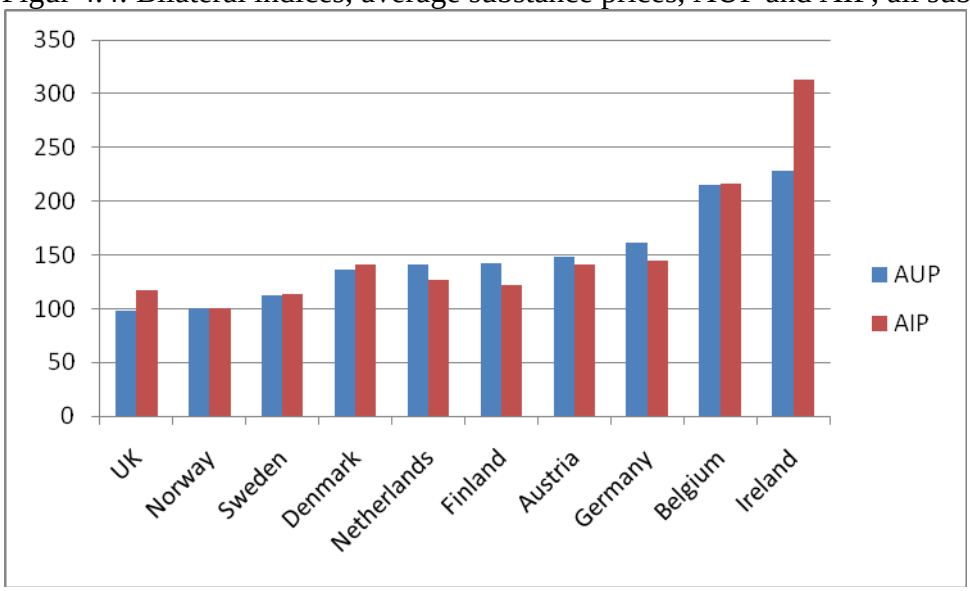
If we look at the price indices for top-selling packs with generic competition (called "generic"), UK is still cheapest (12.9 per cent) followed by Norway and Sweden that is 11.2 per cent more expensive than Norway. As before, Ireland, Belgium and Germany are the most expensive countries. However, if we look at the products subject to reference pricing (trinnpris) in Norway, then Norway is the cheapest country followed by Sweden (13 per cent more expensive) and UK (23 per cent more expensive). For these products also the price differences are much larger than for the rest of the products. Ireland is for instance about 175 per cent more expensive on the same packs as in Norway at retail level.

As mentioned above, a main problem with price indices based on identical packs is that representativity is low.[9] We therefore proceed by calculating price indices based on the volume-weighted average prices per substance per dose.

4.3. Price indices based on average substance prices

We start out by calculating bilateral price indices. The procedure is the same as for identical packs, apart from the fact that here we match active substances instead. Table 4.2 below presents all bilateral price indices we have calculated based on the volume-weighted average substance prices per dose. Here we only focus on the main results.

Figur 4.4: Bilateral indices, average substance prices, AUP and AIP, all substances.



From the figure we see that UK is still the cheapest country when we compare prices of all substances, but the price differences are much smaller than for identical packs (see Figure 4.1). UK is now only 2.1 per cent less expensive than Norway. Sweden is the third cheapest country, while Ireland and Belgium are the most expensive countries. If we look at wholesale prices (AIP), Norway is the cheapest country followed by Sweden and UK. This picture is fairly similar to the one we got when comparing prices of identical packs.

[9] See Danzon and Chao (2000) for a full discussion and analysis of the problems associated with basing price indices on identical packs.

Table 4.2. Bilateral price indices (AIP and AUP) based on volume-weighted average substance prices per dose.

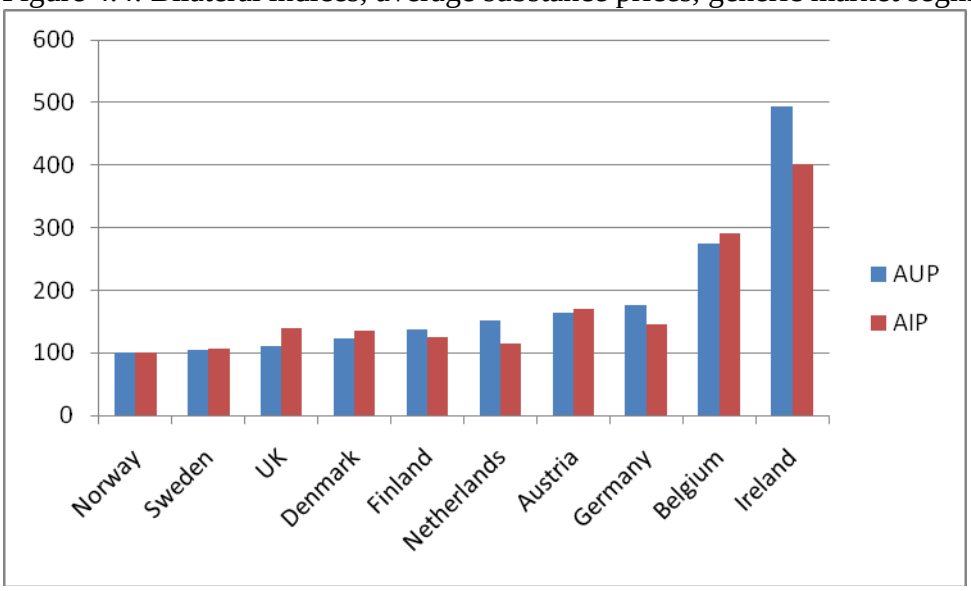
	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
All substances										
AIP per dose	100	114,4	141,5	122,1	116,8	144,7	126,9	216,0	140,6	228,3
AUP per dose	100	112,2	136,3	142,4	97,9	161,8	141,0	215,5	147,9	313,5
Number of substances		273	268	263	256	259	264	246	253	257
Substances on patent (without generic competition)										
AIP per dose	100	118,2	144,9	120,4	102,7	144,2	133,5	175,9	125,1	135,3
AUP per dose	100	116,8	145,0	146,1	88,6	152,4	134,3	177,3	137,7	195,7
Number of substances		154	152	148	140	148	147	134	136	144
Substances off patent (with generic competition)										
AIP per dose	100	107,3	135,0	125,2	138,6	145,7	114,3	291,1	169,2	400,9
AUP per dose	100	105,1	122,8	136,7	109,9	176,9	151,3	274,2	163,2	492,9
Number of substances		119	116	115	116	111	117	112	117	113
Substances under reference pricing (trinnpris)										
AIP per dose	100	126,9	150,5	133,7	142,0	187,8	136,7	272,3	207,6	321,4
AUP per dose	100	114,5	135,6	144,0	112,9	187,0	167,3	244,7	199,7	397,9
Number of substances		44	45	45	44	43	44	44	45	45

Table 4.3. Global price indices (AIP and AUP) for substances present in all countries based on volume-weighted average substance prices per dose.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
All substances (N = 198)										
AIP per dose	100	117,7	139,3	124,1	110,4	146,2	125,7	184,0	141,7	174,0
AUP per dose	100	114,8	133,8	146,4	93,3	160,3	138,5	182,5	150,8	241,5
Substances on patent (without generic competition) (N = 104)										
AIP per dose	100	119,9	143,8	120,6	104,2	145,7	138,0	176,6	125,4	129,5
AUP per dose	100	118,2	143,5	148,7	89,5	155,3	138,8	179,5	141,0	187,9
Substances off patent (with generic competition) (N = 94)										
AIP per dose	100	114,0	131,9	129,9	120,7	146,9	105,4	196,3	168,6	247,5
AUP per dose	100	110,1	120,5	143,2	98,6	167,1	138,1	186,5	164,2	315,3
Substances under reference pricing (trinnpris) (N = 41)										
AIP per dose	100	129,9	148,5	137,4	139,6	190,0	137,3	270,6	204,7	317,9
AUP per dose	100	116,6	132,0	148,6	111,1	188,8	166,9	243,2	197,9	392,7

We also calculate separate price indices for the patent and the generic market segments. We see from Table 4.2 that the picture for the patent segment is quite similar to the one for all substances. However, this is not the case for the off-patent market segment. The price indices for this market segment are given by Figure 4.4 below.

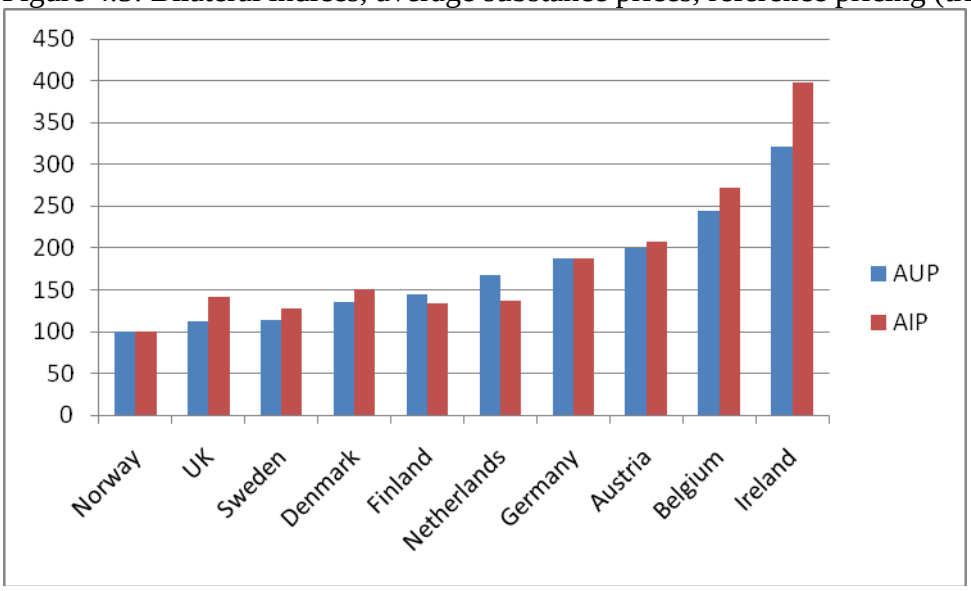
Figure 4.4: Bilateral indices, average substance prices, generic market segment



If we look at the pharmacy prices (AUP), we see that Norway is now the cheapest country followed by Sweden (5 per cent more expensive) and UK (9 per cent more expensive). Thus, the results are sensitive to whether one compares prices of identical packs or average price per dose for substances common to both countries. As before, Belgium and Ireland are by far the most expensive countries in the generic market segment. This pattern is fairly similar if we look at the wholesale prices, though the price differences become lower, and some countries (Ireland, Germany and the Netherlands) become relatively less expensive. The change in ranking and price differences between AUP and AIP reflects differences in retail pharmacy margins.

A subset of substances in the generic market segment is subject to reference pricing (trinnpris). Figure 4.5 shows the price indices for this segment. We see that Norway is even cheaper than its reference countries for these products. UK is the second cheapest country being 12.9 per cent more expensive than Norway, whereas Sweden is the third cheapest country with 14.5 per cent higher prices than Norway. Belgium and Ireland are by far the most expensive countries also for this set of substances.

Figure 4.5: Bilateral indices, average substance prices, reference pricing (trinnpris)



4.4. Price indices for global substances

An alternative way of calculating price indices is to limit the sample to active substances for which we have price observations in all countries, i.e. global matching. An advantage of this approach is that we have price observations for all active substances in the sample. Another advantage is that the comparison between two foreign countries, say, Sweden and UK, is now more precise since we compare prices of products that are present in every country. When we apply the requirement of global matching, the number of active substances in the sample is reduced to 198, which equates to about 70% of the total sample of active substances in Norway. While we lose some observations, the representativity is still very high and much higher than the price comparisons of identical packs. We calculate several price indices based on global substances, which all are reported in Table 4.3 above. Below we focus on the main results from these figures.

Figure 4.6 shows the global price indices for all (198) active substances at both wholesale (AIP) and retail (AUP) level. We see that UK is still the cheapest country if we look at retail, pharmacy prices, being about 6.7 per cent less expensive than Norway. Norway is as before the second cheapest country, followed by Sweden, where prices are on average 14.8 per cent higher than in Norway. Belgium and Ireland are the two most expensive countries as usual. At wholesale (AIP) level Norway is the cheapest country, which is also what we found using bilateral price indices. The reason UK is cheaper than Norway is that they have lower pharmacy margins. We also see that the price spread is lower at AIP level than at AUP level.

Figure 4.6: Global indices, average substance prices, all substances.

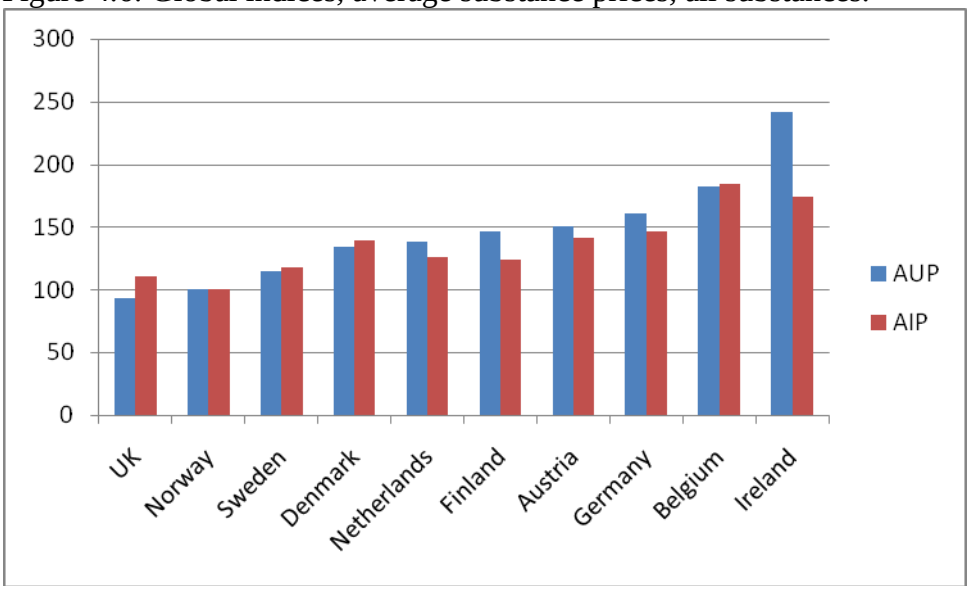
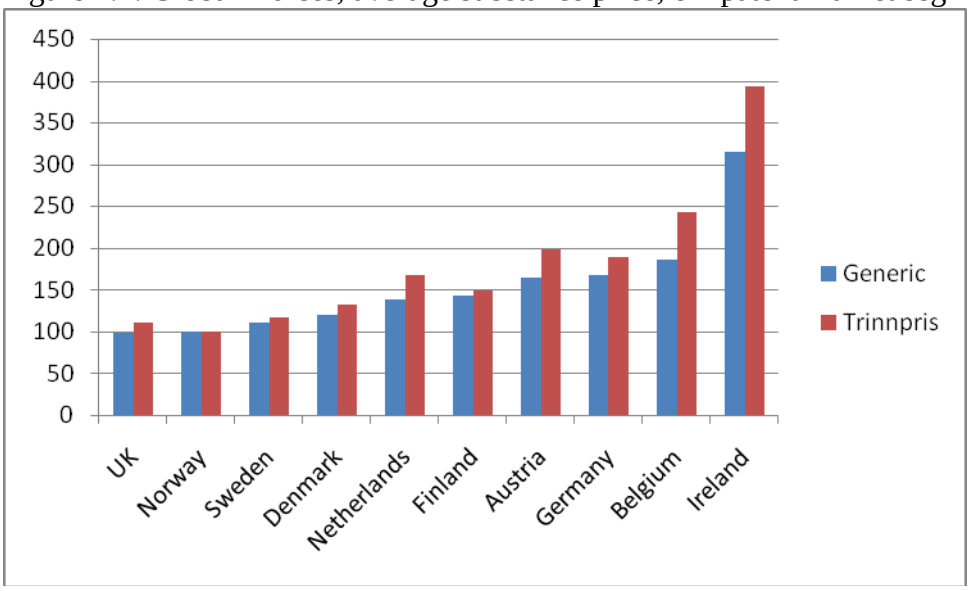


Figure 4.7 present the price indices at AUP level for the generic market segment, as well as the subset of off-patent substances that are subject to reference pricing (trinnpris) in Norway. We see that UK have only marginally lower (1.4 per cent) prices at the generic market segment, while Norway is 11.1 per cent cheaper for the off-patent substances under reference pricing (trinnpris). Sweden is third as usual, followed by Denmark.

Figure 4.7: Global indices, average substance price, off-patent market segment (AUP)



The overall conclusion is that the rankings seem to be fairly consistent and robust across the various approaches in how to calculate the price indices. There are some differences across market segments, but UK, Norway and Sweden are consistently the three cheapest countries in all indices, and Germany, Belgium and Ireland are the three most expensive countries in almost all price comparisons.

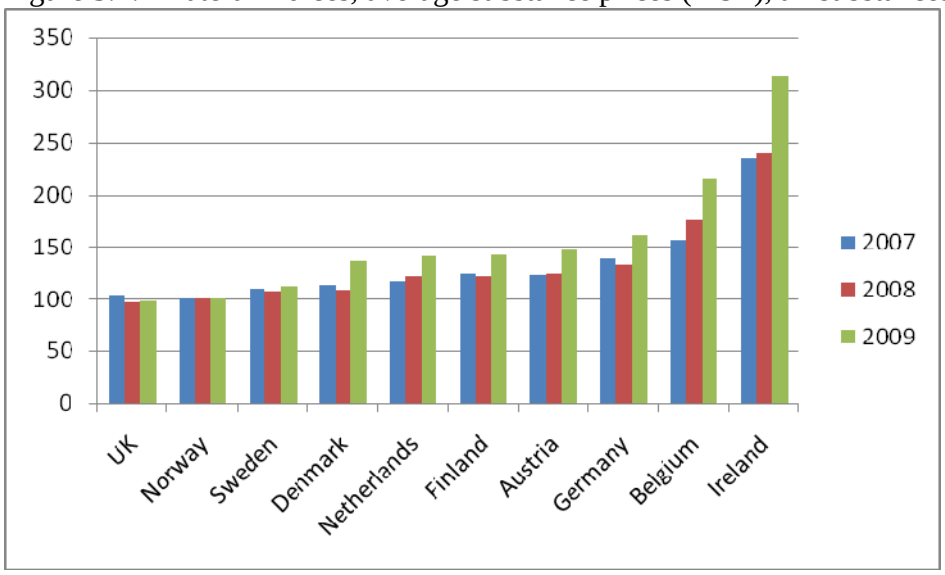
Chapter 5. Changes in prices and price indices from 2007 to 2009

In this chapter we look at the changes in price indices for the three year period from 2007 until 2009. The data for 2007 and 2008 are obtained from our two previous reports on cross-country price comparisons of pharmaceuticals in Europe (see Brekke, Holmås and Straume 2008, 2009). Having data over time (not just across countries) allows us to examine potential trends in prices in Norway and the reference countries. It also allows us to examine how sensitive price indices are to exchange rate fluctuations. First, we compare the price indices across years. Second, we check whether the changes in the indices are due to exchange rate fluctuations by computing this year's price indices using last year's exchange rates. Finally, we look at the nominal price changes for each country using products that were present in all years.

5.1. Development in price indices 2007-2009

Figure 5.1 below plots the bilateral (AUP) price indices based on volume-weighted average substance prices per dose for all substances in our sample. The figures from 2007 and 2008 are obtained from Brekke, Holmås and Straume (2008, 2009). In the figure below, we rank the countries from cheapest to most expensive in 2009.

Figure 5.1: Bilateral indices, average substance prices (AUP), all substances, 2007-2009.



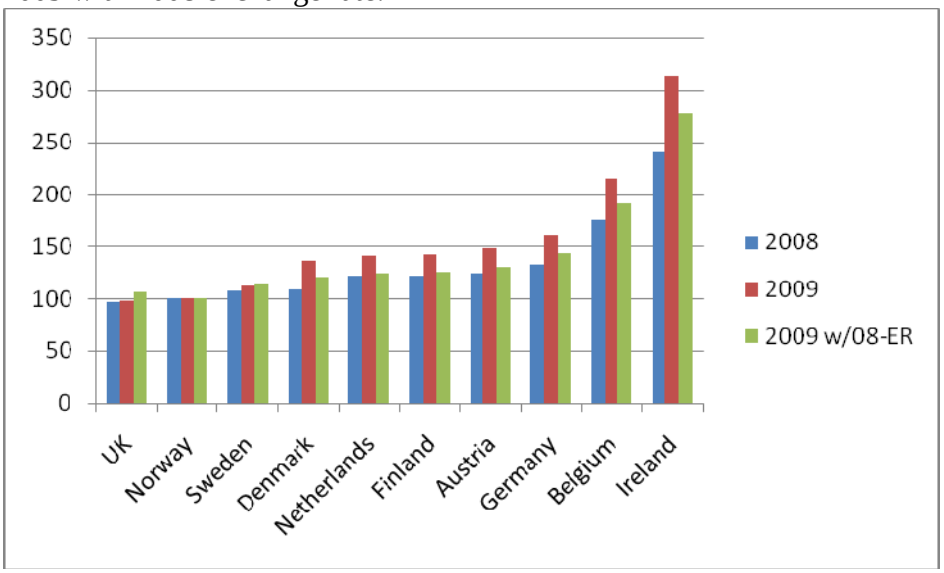
The main picture is that the ranking of countries is very consistent and robust across years with one minor exception. UK has gone from being slightly more expensive than Norway to being slightly less expensive. However, if we look at the differences in the price indices across years, we see that while most countries became slightly less expensive relative to Norway between 2007 and 2008, the opposite is true between 2008 and 2009. In this period, most countries seem to become more expensive relative to Norway. While the change is marginal for UK and Sweden, this is not the case for the rest of the countries. Especially, Ireland is now 213.5 per cent more expensive than Norway in 2009, wheras they were "only" 140.4 per cent more expensive in 2008.

What can explain the observed development in the price indices? Generally, there are four sources of change in the price indices over time.

1. Fluctuations in exchange rates
2. Different trends in prices of pharmaceuticals
3. Changes in the sample of substances and products
4. Changes in the Norwegian consumption weights.

We will first take a look at the most obvious source of change in the price indices, namely the exchange rates. The obvious way to analyse the impact of exchange rate fluctuations is to calculate this year's price indices by using last year's exchange rates. Table 5.1 reports all the bilateral price indices for 2009 based on average substance prices (cf. Table 4.2) when using 2008 exchange rates.[10] Figure 5.2 below illustrates the rankings of the overall price indices using all substances.

Figure 5.2: Bilateral indices, average substance prices (AUP), all substances, 2008, 2009 and 2009 with 2008 exchange rate.



We see that all countries, except for UK and Sweden, get a lower 2009 price index when using 2008 exchange rates. The reason for this is that the EURO has become more valuable relative NOK during this period. The same argument applies to Danish kroner, while the British Pounds and Swedish kroner have become slightly less valuable relative to NOK. However, exchange rate fluctuations do not explain the whole change in the price indices. Even when controlling for exchange rates, we see that all countries become more expensive relative to Norway during this from 2008 to 2009, though the changes are much weaker.

[10] The same exercise is done in Brekke, Holmås and Straume (2009) for the years 2007 and 2008. There we also see that exchange rate fluctuations explain quite a lot of the variation in the price indices across years.

Tabell 5.1. Bilateral price indices (AIP and AUP) for average substance prices in 2009 using exchange rates from 2008.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherlands	Belgium	Austria	Ireland
All substances										
AIP per dose	100	116,1	125,1	108,0	126,3	128,0	112,3	191,1	124,4	201,7
AUP per dose	100	113,9	120,5	125,9	105,9	143,1	124,7	190,6	130,8	277,1
Number of substances		273	268	263	256	259	264	246	253	257
Substances on patent (without generic competition)										
AIP per dose	100	120,0	128,1	106,5	111,1	127,5	118,1	155,6	110,7	119,7
AUP per dose	100	118,6	128,2	129,3	95,8	134,8	118,8	157,0	121,8	173,2
Number of substances		154	152	148	140	148	147	134	136	144
Substances off patent (with generic competition)										
AIP per dose	100	108,9	119,3	110,7	149,9	128,9	101,1	257,4	149,7	354,0
AUP per dose	100	106,6	108,5	120,9	118,8	156,4	133,9	242,5	144,4	435,2
Number of substances		119	116	115	116	111	117	112	117	113
Substances under reference pricing (trinnpris)										
AIP per dose	100	128,7	133,0	118,2	153,6	166,1	120,9	240,9	183,6	284,3
AUP per dose	100	116,1	119,8	127,3	122,1	165,4	148,0	216,4	176,6	352,0
Number of substances		44	45	45	44	43	44	44	45	45

5.2. Nominal changes in pharmaceutical prices 2007-2009

A second source of changes in the price indices is national variations in how prices develop over time. Do prices decline faster in Norway than in the reference countries? In this section we compare the prices for the same product in 2007, 2008 and 2009 in each country's own currency. Obviously, if a new product enter (or an "old" product exit) the sample, this product will not be included in the price change. Thus, we compare the price development for products that are present in all periods. Price changes are measured only at pharmacy retail price (AUP) level, and the change is measured as follows:

$$\text{Price change} = \frac{AUP_t - AUP_{t-1}}{AUP_{t-1}}, \text{ where t = 2009 and t-1 = 2007 or 2008.}$$

Price changes are not adjusted for inflation, implying that we look at nominal price changes in each country. The price changes are also measured separately for the patent and the generic market segments, as well as the reference priced products (trinnpris). Table 5.2 below presents the results for the period of 2008-2009.

Tabell 5.2: Nominal changes in average pharmacy prices (AUP) from 2008 to 2009 (own currency), the number of substances in parenthesis.

	All substances	On-patent substances	Off-patent substances	Reference priced substances
Norway	-0,014 (232)	-0,029 (123)	0,002 (109)	0,000 (45)
Sweden	-0,001 (227)	0,006 (119)	-0,007 (108)	-0,037 (43)
Denmark	-0,007 (221)	0,026 (117)	-0,045 (104)	-0,110 (45)
Finland	-0,023 (222)	-0,014 (117)	-0,032 (105)	-0,094 (45)
UK	-0,002 (219)	-0,001 (113)	-0,003 (106)	0,002 (44)
Germany	-0,021 (217)	0,004 (118)	-0,049 (99)	-0,058 (42)
Netherlands	-0,049 (226)	-0,015 (120)	-0,086 (106)	-0,206 (43)
Belgium	-0,008 (211)	0,003 (110)	-0,021 (101)	-0,023 (43)
Austria	-0,004 (214)	0,002 (107)	-0,010 (107)	-0,051 (45)
Ireland	-0,149 (219)	-0,137 (133)	-0,161 (106)	-0,198 (45)

If we look at all substance, then prices decline in every country. The largest change is in Ireland, with a 14.9 per cent price reduction. This is likely due to reductions in the regulated margins that pharmacies are allowed to calculate in Ireland. In Norway the prices declined with 1.4 per cent. Most countries have an even weaker reduction in the prices. In the on-patent segment, the price reduction is 2.9 per cent on average for Norway. Only Ireland has a larger reduction than Norway. In fact, several countries face a marginal price increase on products in this segment.

For the off-patent market segment, we see that prices decline in all countries, except for Norway. At first glance this seems counterintuitive since Norway is the most or second cheapest country according to the price indices for this market segment. However, a potential explanation is that the prices decline instantaneously, especially for the drugs under reference pricing (trinnpris), but then stay fairly constant at the lower price level afterwards. This is consistent with the results in Table 5.3 below.

Using the 2007 data, we can compare the price changes over three years. Table 5.3 below summarises the findings.

Tabell 5.3: Nominal change in average pharmacy prices (AUP) from 2007 to 2009 (own currency), the number of substances in parenthesis.

	All substances	On patent substances	Off patent substances	Reference priced substances
Norway	-0,027 (232)	-0,035 (123)	-0,017 (109)	-0,079 (45)
Sweden	-0,001 (227)	0,006 (119)	-0,013 (108)	-0,046 (43)
Denmark	-0,040 (221)	-0,003 (117)	-0,081 (104)	-0,152 (45)
Finland	-0,033 (222)	-0,012 (117)	-0,056 (105)	-0,126 (45)
UK	0,011 (219)	0,017 (113)	0,000 (106)	-0,057 (44)
Germany	-0,000 (217)	0,047 (118)	-0,057 (99)	-0,098 (42)
Netherlands	0,156 (226)	0,289 (120)	0,004 (106)	-0,103 (43)
Belgium	-0,018 (211)	-0,004 (110)	-0,034 (101)	-0,066 (43)
Austria	0,008 (214)	0,042 (107)	-0,026 (107)	-0,097 (45)
Ireland	-0,150 (219)	-0,144 (113)	-0,157 (106)	-0,214 (45)

If we compare with 2007, we see that Norway has experienced a greater price reduction than from 2008. For all substances, we have had a 2.7 per cent reduction, where 3.5 per cent is due to price reductions in the on-patent segment and 1.7 is due to price reductions in the generic market segment. Especially, for the substances under reference pricing, the price reductions have been larger. Combining the figures in Table 5.2 and 5.3 suggest that while price reductions seem to be consistent in the on-patent segment, the trend is weaker in the generic market segment, even for the reference priced products.

For the rest of the countries, we see again that Ireland has the largest price reductions over the period, while in fact the Netherlands has the highest price increases. The rest of the countries experience fairly stable price trends over this time span.

6. Regression analyses

In this part of the report we analyse differences in pharmacy prices and margins using regression analyses. An advantage of this kind of analysis compared with calculating indices is that it is possible to study price differences between countries corrected for the fact that other aspects may also vary. We have for example seen that pack size varies considerably. Correcting for pack size in the regressions means (in somewhat simplified terms) that we compare prices between countries for identical pack sizes. In the analyses we would also like to correct for the proportion of each active substance sold as tablets. We have also tried to use the strength of the pharmaceutical as an explanatory variable, but as this had no significant effect we have chosen to omit this variable from the analyses. In analyses of this kind, we can also correct for the fact that not all countries are represented with the same active substances in the data set. We do this by including a dummy variable for each active substance[11], which implies that we are comparing the prices of the identical active substances. In these analyses, we will therefore expect the results (the differences between the countries) to be less sensitive to which active substances we include in the analyses.

6.1. Pharmacy prices (AUP)

In the regression analyses, we have chosen to focus on volume-weighted average prices (see Chapter 4.1 for an explanation of how these have been calculated). In these analyses, we use dummy variables to identify price differences between countries. In other words, we have, for each country, constructed a variable with value 1 for all price observations for that country, while the variable has the value 0 for price observations for all other countries. As we have 10 countries, we obtain 10 such dummy variables. To be able to identify the effect of these variables, i.e. how much of the price differences they explain, we must omit a variable. We have chosen to omit the variable for Norway, which means that we compare prices in the other countries with prices in Norway. For example, we can see from the results in Table 6.1 below that the estimated effect of the variable "Denmark" is 0.110, which means that prices in Denmark are 11 per cent higher than in Norway (this interpretation is due to the fact that prices are in logarithmic form). A negative value could accordingly be interpreted as how many per cent lower the average price was, compared with the price level in Norway. However, it is important to note whether or not the estimated effect of the variable is statistically significant. If we consider the coefficient for "Sweden", this has a value equal to 0.051. As this is not statistically significant (coefficients that are statistically significant are asterisked), we conclude that average prices in Sweden do not differ from those in Norway.

In Table 6.1 we present the results from regression analyses where we use all active substances (columns 2-4) and only global active substances (columns 5-7). We further distinguish the active substances according to whether they are on or off patent. In the same way as when we compared price levels using indices, we also find here that Norway proves to have low pharmaceutical prices. As expected, the results are relatively similar if we analyse the entire sample of

[11] We estimate fixed effect models.

pharmaceuticals or only consider the sample of global pharmaceuticals. When discussing the results, we therefore only focus on the total sample. We can also see from the table that the price differences are not as great as when we compared the price indices in the previous chapter. Part of the reason for this may be that, in this part of the analysis, we do not weight the prices with Norwegian consumption weights.

If we focus on all substances for the entire sample (column 2), we find that Ireland has clearly the highest prices, approximately 64 per cent higher than in Norway. Belgium and Germany also have high prices (33 and 37 per cent higher respectively than in Norway), while Austria, Finland and the Netherlands has a price level around 21-28 per cent higher than Norway. Denmark has a price level 11 per cent higher than Norway, while the Swedish price level does not differ significantly from the Norwegian price level. United Kingdom is the only country with a price level lower than Norway (20 per cent).

Table 6.1 Differences in pharmacy prices (AUP), volume-weighted substance prices.

	Total sample			Global substances		
	All substances	Substances without generic competition	Substances with generic competition	All substances	Substances without generic competition	Substances with generic competition
Sweden	0.051	0.111***	-0.028	0.071	0.138***	-0.008
	(0.039)	(0.033)	(0.076)	(0.045)	(0.037)	(0.083)
Denmark	0.110***	0.272***	-0.098	0.086**	0.269***	-0.115
	(0.039)	(0.034)	(0.077)	(0.044)	(0.033)	(0.082)
Finland	0.243***	0.321***	0.141*	0.273***	0.361***	0.172**
	(0.039)	(0.033)	(0.076)	(0.044)	(0.037)	(0.077)
Netherlands	0.276***	0.230***	0.337***	0.249***	0.251***	0.262***
	(0.034)	(0.033)	(0.076)	(0.044)	(0.037)	(0.082)
Austria	0.210***	0.212***	0.204***	0.238***	0.253***	0.222***
	(0.040)	(0.030)	(0.077)	(0.045)	(0.036)	(0.083)
United Kingdom	-0.203***	-0.204***	-0.199***	-0.217***	-0.177***	-0.255***
	(0.039)	(0.034)	(0.076)	(0.044)	(0.037)	(0.082)
Belgium	0.329***	0.402***	0.251***	0.365***	0.455***	0.296***
	(0.040)	(0.038)	(0.090)	(0.047)	(0.040)	(0.096)
Germany	0.365***	0.335***	0.403***	0.376***	0.374***	0.374***
	(0.039)	(0.033)	(0.077)	(0.044)	(0.036)	(0.082)
Ireland	0.641***	0.532***	0.780***	0.615***	0.520***	0.726***
	(0.039)	(0.033)	(0.077)	(0.044)	(0.037)	(0.082)
Pack size	-0.0034***	-0.0026***	-0.0038***	-0.0037***	-0.0019***	-0.0048***
	(0.0004)	(0.0004)	(0.0005)	(0.0004)	(0.0005)	(0.0007)
Proportion tablets	-0.157***	-0.121***	-0.167*	-0.115**	-0.114***	-0.051
	(0.046)	(0.040)	(0.098)	(0.052)	(0.040)	(0.107)
Constant	2.327***	2.984***	1.461***	2.102***	2.644***	1.435***
	(0.039)	(0.033)	(0.083)	(0.046)	(0.037)	(0.094)
Dummy for molecule	yes	yes	yes	yes	yes	yes
Number of molecules	279	159	120	199	104	95
Number of observations	2618	1462	1156	1990	1040	950
R^2	0.252	0.375	0.246	0.259	0.418	0.251

***: significant at 1 percent level. **: significant at 5 percent level. *: significant at 10 percent level.

In the same way as previously, we also distinguish active substances according to whether or not they have generic competition in Norway. If we focus on the total sample of active substances for which we do not observe generic competition (column 3 in the Table), we see that Norway has lower pharmaceutical prices than all other countries with the exception of the United Kingdom. Average pharmaceutical prices for active substances without generic competition are approximately 20 per cent lower in the United Kingdom than in Norway. If we consider the other countries, the ranking is as follows (with the relative price difference from Norway in brackets): Ireland (53%), Belgium (40%), Germany (34%), Finland (32%), Denmark (27%), the Netherlands (23%), Austria (11%) and Sweden (11%).

If we consider price differences for pharmaceuticals with generic competition, we still find that most countries have higher pharmaceutical prices than Norway (see column 4). If we rank the countries according to how expensive they are compared with Norway, we find the following: Ireland (78%), Germany (40%), Netherlands (34%), Belgium (25%) and Finland (14%). For Sweden and Denmark we do not find significantly different prices compared to Norway, while the price level in United Kingdom is approximately 20 per cent lower than in Norway.

6.2. Pharmacy margins

In Table 6.2 below, we present the results from regression analyses in which we analyse how pharmacy margins vary between countries. We carry out the same classification of active substances as above (all active substances in the sample, active substances available in all countries (global), active substances without generic competition in Norway and active substances with generic competition in Norway) and use the same explanatory variables. The dependent variable (pharmacy percentage margin) is given by

$$M = \frac{AUP - AIP}{AUP},$$

where AUP and AIP are calculated as volume-weighted average prices. In the same way as previously, we use dummy variables to identify differences between countries. We use Norway as a comparison country; if we look at Table 6.2, column 2, we find for example that Finland has a value equal to 0.121. This means that the (percentage) margin is on average 12.1 percentage points higher in Finland than in Norway. If we start by looking at all active substances, we see, as above, that the results vary little whether we use the total sample or only the global active substances. Focusing on the former, we find that Ireland has clearly the highest percentage margins, 25 percentage points higher than in Norway. The average margin in Norway is approx. 18 per cent (given by the constant in the model), i.e. the average margin in Ireland is approx. 43 per cent (18 + 25). Finland, the Netherlands and Germany also seem to have relatively high percentage margins, with the same applying to a lesser extent to Austria and the United Kingdom. Pharmacy margins in Sweden, Denmark and Belgium are not significantly different from those in Norway.

Table 6.2 Differences in pharmacy percentage margins.

	Total sample			Global substances		
	All substances	Substances without generic competition	Substances with generic competition	All substances	Substances without generic competition	Substances with generic competition
Sweden	0.004	-0.008	0.022*	-0.001	-0.015*	0.020
	(0.008)	(0.008)	(0.013)	(0.010)	(0.009)	(0.015)
Denmark	-0.013	-0.005	-0.023*	-0.014	-0.008	-0.018
	(0.008)	(0.007)	(0.014)	(0.010)	(0.009)	(0.015)
Finland	0.121***	0.153***	0.082***	0.119***	0.153***	0.084***
	(0.008)	(0.007)	(0.014)	(0.009)	(0.008)	(0.015)
Netherlands	0.114***	0.059***	0.184***	0.121***	0.055***	0.196***
	(0.008)	(0.007)	(0.014)	(0.009)	(0.008)	(0.015)
Austria	0.027***	0.064***	-0.018	0.027***	0.071***	-0.026*
	(0.008)	(0.08)	(0.014)	(0.010)	(0.009)	(0.015)
United Kingdom	0.017**	-0.042***	0.087***	0.015	-0.056***	0.091***
	(0.008)	(0.008)	(0.014)	(0.010)	(0.008)	(0.015)
Belgium	0.006	0.021**	-0.017	0.001	0.019**	-0.026
	(0.009)	(0.009)	(0.017)	(0.011)	(0.009)	(0.019)
Germany	0.087***	0.051***	0.137***	0.088***	0.049***	0.132***
	(0.008)	(0.007)	(0.014)	(0.009)	(0.008)	(0.015)
Ireland	0.252***	0.288***	0.202***	0.246***	0.286***	0.200***
	(0.008)	(0.008)	(0.014)	(0.009)	(0.008)	(0.015)
Pack size	0.0001	-0.0003***	0.0001	-0.0001	-0.0001	-0.0002**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Proportion tablets	0.0152	0.0127	0.0097	0.0092	0.0167*	-0.0037
	(0.0096)	(0.0085)	(0.0175)	(0.0111)	(0.0092)	(0.0172)
Constant	0.183***	0.139***	0.260***	0.199***	0.137***	0.283***
	(0.008)	(0.007)	(0.015)	(0.010)	(0.009)	(0.017)
Dummy for molecule	yes	yes	yes	yes	yes	yes
Number of molecules	279	159	120	199	104	95
Number of observations	2618	1462	1156	1990	1040	950
R^2	0.442	0.698	0.408	0.440	0.735	0.423

***: significant at 1 percent level. **: significant at 5 percent level. *: significant at 10 percent level.

If we distinguish the active substances according to whether or not we observe generic competition (column 3 and 4), the results change somewhat. We see that, compared to Norway, pharmacy percentage margins in Germany and Netherlands are particularly high for substances with generic competition, while Finish margins are highest for substances without generic competition. Pharmacy percentage margins in United Kingdom are lower than in Norway for substances without generic competition, while the opposite is the case for substances with generic competition. Sweden and Denmark have the same percentage margins as Norway for substances without generic competition, while Swedish margins are slightly higher and Danish margins are slightly lower than Norwegian margins for substances with generic competition.

7. Concluding remarks

In this study we have compared prices of prescription drugs in Norway and the following nine Western European countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, UK and Sweden. These countries comprise the basket for the Norwegian price cap regulation and are considered to be fairly similar and comparable countries.

Data are obtained from IMS Health and contain detailed information of all prescription bound sales within the top 300 substances on the Norwegian market for the first half of 2009. The data have information of prices at wholesale (AIP) and retail (AUP) level per pack and per standard dose. The data also contain information about sales volumes (packs and doses), patent status, brand-name or generic, presentation form, strength, etc.

Based on these data, we compare prices of prescription drugs across countries using several different approaches. We start out with the standard approach by calculating price indices for identical packs (same pack size and strength), where we pick the most selling pack in Norway for each substance and compare the price of this pack with the price of corresponding packs in each of the reference countries. However, this approach involves several problems. First, we ignore information on all other packs sold within a given substance in Norway and abroad. Second, the top selling packs in Norway are not necessarily the top selling packs abroad and in many cases these packs are not available in the reference countries. We therefore also calculate volume-weighted average prices per dose for each substance. This approach uses all price information and provides us with a representative price for each country. Based on these prices, we calculate bilateral price indices (substances common to Norway and a given foreign country) and global price indices (substances common to all countries). Finally, we have estimated price difference across countries by using regression analysis. This approach allows us to test whether price differences are statistically significant. It also allows us to control for differences in pack size and the fraction of tablets sold within each substance. When using regression analysis we can also correct for the fact that not all countries have the same set of substances in their market.

Table 7.1 below summarises the findings by presenting the ranking of countries for each of the price comparisons that we perform, also for the different market segments. The main finding is that UK, Norway and Sweden consistently have the lowest pharmacy prices (AUP) of prescription drugs, whereas Ireland, Belgium and (most of the time) Germany have the highest prices.

Tabell 7.1 Summary of rankings according to price indices and regression analysis at pharmacy price (AUP) level.

	All substances				Patent market segment			
	Bilateral indices, pack prices	Bilateral indices, substance prices	Global indices, substance prices	Regression analysis	Bilateral indices, pack prices	Bilateral indices, substance prices	Global indices, substance prices	Regression analysis
1	UK	UK	UK	UK	UK	UK	UK	UK
2	Norway	Norway	Norway	Norway	Norway	Norway	Norway	Norway
3	Sweden	Sweden	Sweden	Sweden	Sweden	Sweden	Sweden	Sweden
4	Netherlands	Denmark	Denmark	Denmark	Netherlands	Netherlands	Netherlands	Austria
5	Austria	Netherlands	Netherlands	Austria	Austria	Austria	Austria	Netherlands
6	Denmark	Finland	Finland	Finland	Finland	Denmark	Denmark	Denmark
7	Finland	Austria	Austria	Netherlands	Denmark	Finland	Finland	Finland
8	Germany	Germany	Germany	Belgium	Germany	Germany	Germany	Germany
9	Belgium	Belgium	Belgium	Germany	Ireland	Belgium	Belgium	Belgium
10	Ireland	Ireland	Ireland	Ireland	Belgium	Ireland	Ireland	Ireland

	Generic market segment				Reference priced (trinnpris) drugs			
	Bilateral indices, pack prices	Bilateral indices, substance prices	Global indices, substance prices	Regression analysis	Bilateral indices, pack prices	Bilateral indices, substance prices	Global indices, substance prices	Regression analysis
1	UK	Norway	UK	UK	Norway	Norway	Norway	-
2	Norway	Sweden	Norway	Sweden	Sweden	UK	UK	-
3	Sweden	UK	Sweden	Denmark	UK	Sweden	Sweden	-
4	Austria	Denmark	Denmark	Norway	Denmark	Denmark	Denmark	-
5	Denmark	Finland	Netherlands	Finland	Finland	Finland	Finland	-
6	Netherlands	Netherlands	Finland	Austria	Austria	Netherlands	Netherlands	-
7	Finland	Austria	Austria	Belgium	Netherlands	Germany	Germany	-
8	Germany	Germany	Germany	Netherlands	Germany	Austria	Austria	-
9	Belgium	Belgium	Belgium	Germany	Belgium	Belgium	Belgium	-
10	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland	-

We have also taken a closer look at the development in price indices from 2007 to 2009 by including the data from our two previous studies (Brekke, Holmås and Straume, 2008, 2009). First, we find that there are large changes in the price indices from 2008 to 2009. All countries become more expensive than Norway. Using 2008 exchange rates to recalculate the 2009 price indices, we find that a significant part of the changes are driven by exchange rate fluctuations. However, even when correcting for exchange rate fluctuations, all countries become more expensive than Norway, though the difference is much smaller. We therefore proceed by looking at the nominal price changes in each country. Here we find that Norway has a fairly large reduction in prices compared with most of the reference countries (except for the generic market segment), which might explain some of the residual differences in the price indices over time. However, we cannot rule out that also changes in consumption patterns and changes in the top 300 sample over the years might also contribute somewhat to the changes in the price indices.

Finally, we have looked at the pharmacy margins. Using regression analysis, we find that Ireland has clearly the highest margins, 25 percentage points higher than in Norway. The average margin in Norway is approximately 18 per cent, i.e. the average margin in Ireland is approx. 43 per cent (18 + 25). Finland, the Netherlands and Germany also seem to have relatively high margins, with the same applying to a lesser extent to Austria and the United Kingdom. Pharmacy margins in Sweden, Denmark and Belgium are not significantly different from those in Norway. If we decompose the pharmacy margins on the generic and the patent segments, we find that the margins in United Kingdom are lower than in Norway for substances without generic competition, while the opposite is the case for substances with generic competition. Sweden and Denmark have the same margins as Norway for substances without generic competition, while Swedish margins are slightly higher and Danish margins are slightly lower than Norwegian margins for substances with generic competition.

Appendix

Table A1. Bilateral indices (AIP and AUP) by sales volume, Norwegian weights.

	Norway	Sweden	Denmark	Finland	UK	Germany	Netherland	Belgium	Austria	Ireland
50 top-selling active substances										
All substances										
AIP	100	119.0	145.7	122.6	91.8	148.5	125.9	237.8	139.5	235.5
AUP	100	115.5	141.6	143.1	88.2	161.7	140.0	240.4	148.6	340.9
Number molecules		50	49	48	46	47	47	48	46	49
Active substances on patent										
AIP	100	118.8	147.5	121.8	92.4	147.8	129.5	177.7	125.5	121.6
AUP	100	117.1	149.7	148.0	87.9	152.9	135.4	180.8	139.7	186.3
Number molecules		27	27	26	24	27	26	26	25	27
Active substances off patent										
AIP	100	119.3	141.2	124.6	90.6	150.1	116.4	383.7	176.6	517.5
AUP	100	112.3	125.5	133.5	88.7	180.6	149.3	355.2	167.3	645.1
Number molecules		23	22	22	22	20	21	22	21	22
100 top-selling active substances										
All substances										
AIP	100	114.9	141.3	123.0	92.6	145.9	120.8	222.7	138.1	212.9
AUP	100	112.1	136.8	144.0	90.8	161,1	137.0	223.0	146.4	307.5
Number molecules		99	96	95	94	91	95	94	93	94
Active substances on patent										
AIP	100	117.9	146.7	119.8	94.2	145.0	126.3	176.9	125.4	119.6
AUP	100	115.6	147.5	145.5	88.8	151.1	132.2	178.3	138.5	181.4
Number molecules		54	53	51	50	51	53	53	50	51
Active substances off patent										
AIP	100	108.6	129.6	129.7	89.8	147.9	108.4	321.4	165.6	407.0
AUP	100	106.3	118.1	141.5	93.6	179.6	145.4	302.3	160.0	522.7
Number molecules		45	43	44		40	42	41		43
150 top-selling active substances										
All substances										
AIP	100	114.7	139.6	123.3	96.2	145.7	120.7	219.9	138.7	214.5
AUP	100	112.3	134.5	143.6	96.1	161,7	138.7	119.2	146.1	307.8
Number molecules		148	144	142	140	138	144	137	141	142
Active substances on patent										
AIP	100	118.0	146.4	120.8	93.6	145.4	126.1	175.7	124.9	119.3
AUP	100	116.3	146.9	146.8	88.2	151.8	132.6	177.0	137.9	180.8
Number molecules		79	76	74	71	74	77	73	73	74
Active substances off patent										
AIP	100	108.4	126.3	128.1	100.3	146.4	109.7	307.4	165.8	396.9
AUP	100	105.8	114.8	139.5	106.3	178.2	148.5	287.4	159.2	505.9
Number molecules		69	68	68	69	64	67	64	68	68

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